

BYTE-BACK CO.

MD-2 MODEM MANUAL

Your new BYTE-BACK MD-2 MODEM employs the latest technology in modem design. The heart of the MD-2 is the new Motorola MC 14412 modem I.C. Our extensive tests of every unit and every tape ensure that all units operate correctly over the full range of specifications, not just typical conditions.

CONNECTING YOUR MODEM TO YOUR TELEPHONE

Recent rulings by the United States Supreme Court and the Federal Communications Commission make it possible for any telephone subscriber to purchase and install any FCC registered or "grandfathered" telephone equipment on any existing phone service line without purchase or rental of any special "interface" or "protective" device.

The BYTE-BACK MD-2 Modem has not received FCC registration yet. Some non-private phone systems may require non-FCC registered devices to be connected to the phone lines through coupling devices.

HOW TO USE YOUR MODEM

Your telephone & modem must be connected at the same time. If you have an extension phone, you can just unplug one phone and plug your modem in that phone jack. The most convenient way is to purchase a modular dual-jack unit from Radio Shack as shown in Fig. 1. Then your telephone and modem can both be connected at the same outlet.

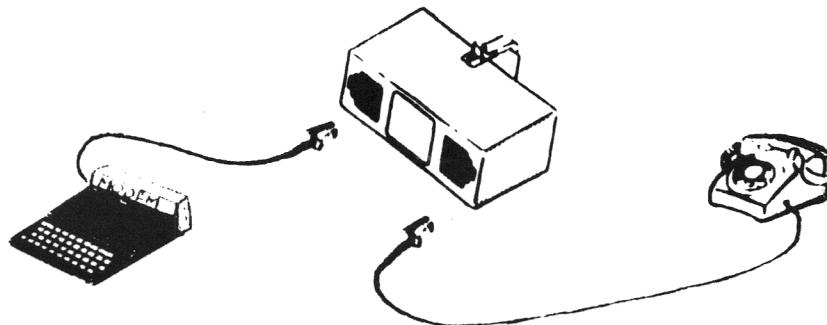


FIG.1

Make sure the power is disconnected from your computer, then plug your modem into the back of your computer. If you have a Timex computer, no additional memory is required to use the 2K version of ZCOMM. For older ZX-81 computers a memory module will be required. It doesn't matter which module is connected in front. To use the 16/64K ZCOMM program, a 16K or 64K memory module will be required. Test your Timex computer & MD-2 modem first without the memory module and use the 2K ZCOMM program.

With the modem connected to your computer, move the rocker switch on the modem to the up (off) position. Plug the modem phone plug into your telephone jack as shown in Fig. 1 and apply power to your computer. Load the 2K ZCOMM program. See your ZCOMM User's Manual for more information on loading and running the ZCOMM program.

When your ZCOMM program is ready, "NOW IN CONVERSATIONAL MODE" will be at the top of your screen. Your modem may now begin to print characters on the screen by itself. This is caused by the high sensitivity of the modem and will quit after the modem has exchanged tones.

Call your host computer and when you hear a high pitched tone (Answer tone = 2000Hz), flip the rocker switch to the down position and you should hear a lower tone (Originate tone = 1000Hz). Now hang up the phone softly. Remember that noise can be translated as characters. DO NOT forget to flip your rocker switch to the up (off) position after you are finished with your modem since the rocker switch in the down position is equivalent to your phone being off the hook.

After modems exchange tones, you are ready to talk to the host Computer. Sometimes you may get a noisy phone connection and have to hang up and call again.

When you add a modem and a memory module, you may begin to overload your 9-volt wall transformer. Unless your transformer is weak or your AC line voltage is low, this should not happen. If necessary, you can parallel two transformers to get higher current without the overload. To tell if you are overloading your transformer, look for a dark horizontal line on the bottom of your TV display. This line will be about one inch wide and will roll from the bottom of the screen to the top about every three seconds. The overload will not hurt the wall transformer or your computer; it just causes display problems.

SUBSCRIBING TO COMPUTER SERVICES

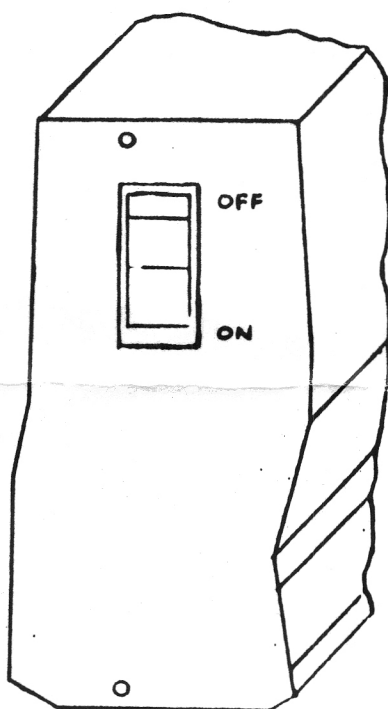
The two most popular time sharing computer services are "CompuServe" and "The Source". BYTE-BACK is a CompuServe dealer. We provide a CompuServe package that allows you five hours of time and gives you your password and complete manual to show you how to get started. CompuServe will bill you additional hours after you use your first five hours at \$5 per hour. This package is \$39.95, including shipping. Radio Shack also sells a package with one hour of time for \$19.95. The Source has a similar package available at local computer stores. The Source has a more expensive hookup fee (\$100), but the hourly rate is about the same.

SERVICE & WARRANTY

All BYTE-BACK modules carry a 90-day warranty. This includes kits. We will repair your MD-2 free during this period if you have any trouble with it. Naturally, in the case of kits, the warranty doesn't cover kits that have been assembled wrong. If your kit doesn't work, return it--without the case--with \$25 and we will repair it. If the problem is found to be defective parts supplied by us, we will refund the full service fee. Please return units to be repaired to: BYTE-BACK COMPANY

Rt. 3 Box 147 Brodie Road
Leesville, SC 29070

Please include a note with your name, address, phone number, and a description of the problem. For questions and assistance you may call us at 803-532-5812. Since you will probably be working on your kit at night, we have engineer on call from 7:00 pm until 10:00 EST to answer your technical questions. We will be glad to assist you. Technical assistance may or may not be available during the day.



ON - In this position the modem is connected to the phone line. It is the same as your phone being off the hook.

On - Push in on the bottom of the rocker switch.

OFF - In this position the modem is disconnected from the phone line.

Off- Push in on the top of the rocker switch.

USE YOUR RS-232 PRINTER WITH YOUR MODEM

If you have an RS-232 printer that will operate at 300 BAUD you can use it to copy information that is being received by your modem. Connect your modem to your printer as follows: (Refer to Fig. 3)

MODEM	*PRINTER WITH 25 PIN EIA CONNECTOR	PRINTER SIGNAL NAME
J2 PIN 8	3	RECEIVED DATA (RXD)
J2 PIN 7	7	GROUND

* If your RS-232 printer doesn't have a 25 pin connector, just select the proper pin by the signal name.

The following modifications must be made to the modem board:

1. Cut the trace from J2 Pin 8 to ground. This is on the back of the board.

2. Solder a jumper from J2 Pin 8 to U11 Pin 8. (It is near Pin 8 of J2.)

3. Solder a jumper from the point marked "J" (to the right of the large 8251 I.C.) to Pin 9 of I.C. U11 (1488).

This modification does not affect the normal operation of the modem.

ByteBack

RS-232 Output Plug

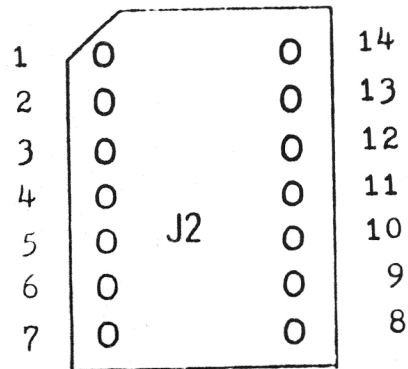


FIG. 3

AS VIEWED FROM THE COMPONENT SIDE OF THE BOARD

Note: The socket is on the back or circuit side of the board, but the pins are numbered as shown viewed from the front side.

- 1 Request To Send (RTS)
- 2 Transmitted Data (TXD)
- 3. Data Terminal Ready (DTR)
- 4 Received Data (RXD)
- 5 Clear To Send (CTS)
- 6 Data Set Ready (DSR)
- 7 thru 14 Ground (GND)

HOW TO DRIVE AN RS-232 PRINTER WHEN NOT USING THE MODEM

Your modem can also be used to drive an RS-232 printer. Connect your printer to J-2. Note J-2 is the I.C. socket type connector inside the modem. It is not the connector coming out the back of the modem. (Refer to Fig. 3)

Connect J-2 as follows:

MODEM	*PRINTER WITH 25 PIN EIA CONNECTOR	PRINTER SIGNAL NAME
J-2 Pin 2	Pin 3	Received Data (RxD)
J-2 Pin 7	7	Ground
J-2 Pin 5	5	Clear to Send (CTS) Busy or Status

* If your RS-232 printer doesn't have a 25 pin connector, just select the proper pin by the signal name.

Your printer should be operating at 300 BAUD. If your printer operates at 600 BAUD, a modification must be made to the modem board. Cut the trace on the back of the modem board that goes from "F" to Pin 4 of I.C. U6. Then solder a jumper from "E" to Pin 3 of U6. This is to run a printer only. The modem will not operate at 600 BAUD. It operates at 300 BAUD.

The following BASIC program can be typed in to allow you to use the LPRINT command.

RS-232 PROGRAM

```

5 POKE 16383,0
6 POKE 16383,0
7 POKE 16383,0
8 POKE 16383,64
10 POKE 16383,206
20 POKE 16383,17
25 GOSUB 160
30 GOTO 500
40 FOR P=1 TO PEEK(16440)-60
50 LET STAT=PEEK(191)
60 IF STAT-INT(STAT/2)*2=0 THEN GOTO 50
70 LET SCH=PEEK(16441)*2
80 IF SCH>127 THEN LET SCH=SCH-128
90 IF SCH>63 THEN LET SCH=SCH-64
100 POKE 38,SCH*11
110 NEXT P
120 LPRINT
130 RETURN
140 POKE 16382,13
150 RETURN
160 DIM S(64)
170 FOR P=2 TO 27
180 LET S(P*3)=P*63
190 IF P>11 THEN GOTO 220
200 LET S(P)=42
210 LET S(P*2)=1+46
220 NEXT P
230 LET S(1)=32
240 LET S(12)=34
250 LET S(13)=36
260 LET S(14)=38
270 LET S(15)=38
280 LET S(16)=63
290 LET S(17)=40
300 LET S(18)=41
310 LET S(19)=62
320 LET S(20)=60
330 LET S(21)=61
340 LET S(22)=43
350 LET S(23)=45
360 LET S(24)=42
370 LET S(25)=47
380 LET S(26)=59
390 LET S(27)=44
400 LET S(28)=46
410 RETURN

```

COMPREHENSIVE EXAMPLE

```

500 Let B$="THIS IS A TEST"
510 LPRINT B$
520 GOSUB 40
530 GOSUB 140
RUN

```

This will print the contents of \$B THIS IS A TEST

The BYTE-BACK modem module is a very versatile unit. We have a machine language program available that will allow it to drive printers or other RS-232 devices. It uses the Timex ROM commands for all of the print features. The program shown here is a short BASIC program that will allow you to use the LPRINT command and output to a printer or other RS-232 device. This program performs the Timex to ASCII conversion. It takes three commands to print something, but it does show you how to get your RS-232 device doing something. You can use sections of this program as a starting point to write your own programs or use our machine language RS-232 program which is available for \$29.95.

To use this BASIC RS-232 program, go through the following steps:

1. Load the RS-232 program.
2. Start your program with statement number 500. Type in your program. Remember, DO NOT use any of the variables or arrays used in the RS-232 program in your program.
3. Use the following three-step process any time you want to print something:
 - (a) Format data in the ZX81/Times 10 printer buffer by using LPRINT. The LPRINT command must end with a semicolon. Example: LPRINT B
 - (b) Transfer the contents of the Sinclair printer buffer via RS-232 module as follows: GO SUB 40.
 - (c) Issue the print command to the printer as follows: GO SUB 140.

Note that variations of this process can be used. Steps (a) and (b) can be repeated several times before using step (c). This will allow you to print several things on one line, up to the width of your printer, usually 80 columns. Note also that this program is set up to use a printer requiring eight bit no parity and two stop bits (206 in line 10 does this). If your printer requires a different format, see the Mode Instruction section of the 8251 I.C. documentation (Fig. 8). For example, if you wanted "7 bits, even parity and one stop bit, you would change line 10 to: POKE 16383, 122. Remember to set the B rate strap on the modem board to agree with your RS-232 device. The board comes with strap "F" in copper. This is for 300 BAUD. Some printers operate at 600 BAUD. This means you would need to cut the strap at "F" and a strap at "F". See the comprehensive example at the left. The next page describes how the RS-232 program works.

RS-232 PROGRAM DESCRIPTION

This BASIC language printer driver is a collection of subroutines which will enable a program to output data on a line printer via the BYTE-BACK RS-232 module. Each subroutine performs a specific function and is identified by the line number of the first executable statement within that subroutine.

SUB-5 HARDWARE SFTUP

This subroutine issues the commands required to interface the RS-232 board to the line printer. The commands are: Setup in the transmission mode, two stop bits, parity disabled, eight bits of data, 16 x baud rate. If a different printer is used these commands may have to be modified.

SUB-40 DATA TRANSFER

This subroutine moves the contents of the Sinclair printer output buffer to the printer. This data is taken by the line printer until either the buffer is full or a print command is received.

SUB-140 PRINT DATA

This subroutine issues the command to the line printer which causes the line printer to print the contents of its buffer.

SUB-160 TRANSLATION TABLE SET-UP

This subroutine initializes an array which is used by SUB-40 to convert the Sinclair character codes into ASCII character codes. This driver is used by performing GO SUB's to the various subroutines at specific points in your program. Every time the Sinclair is reset SUB-5 must be executed.

There is a single number in the programs that determines the Baud Rate, character length, enables or disables parity and if parity is enabled, selects even or odd parity and sets the number of stop bits. The location of this number is as follows:

	<u>Line Or Address</u>	<u>Value</u>
RS-232 Program To Use "LPRINT"	Line 10	206
Printer Software Program	Address 16643	122

The "206" represents 300 Baud, character length of 8 bits, no parity, and two stop bits.

The "122" represents 300 Baud, 7 bits, even parity, and one stop bit.

You can change this number to match any printer or system. Determine the number by selecting one number from each group and adding to get the total.

BAUD RATE	{ 600, 300	add 2	} 2 always
CHARACTER LENGTH	{ 5 bits 6 bits 7 bits 8 bits	add 0 add 4 add 8 add 12	} select one

PARITY {parity enabled.....add 16} select one
 {parity disabled or none..add 0}

EVEN OR ODD PARITY {even parity.....add 32} select one
 {odd parity.....add 0}

NUMBER OF {1 stop bit.....add 64} select one
STOP BITS {1½ stop bits.....add 128}
 {2 stop bits.....add 192}

=TOTAL



LAST NIGHT WE EXCHANGED LETTERS WITH MOM, THEN HAD A PARTY FOR ELEVEN PEOPLE IN NINE DIFFERENT STATES AND ONLY HAD TO WASH ONE GLASS...

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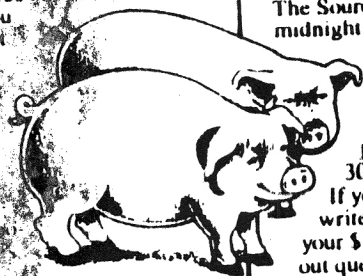
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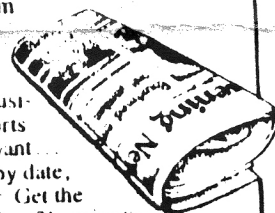
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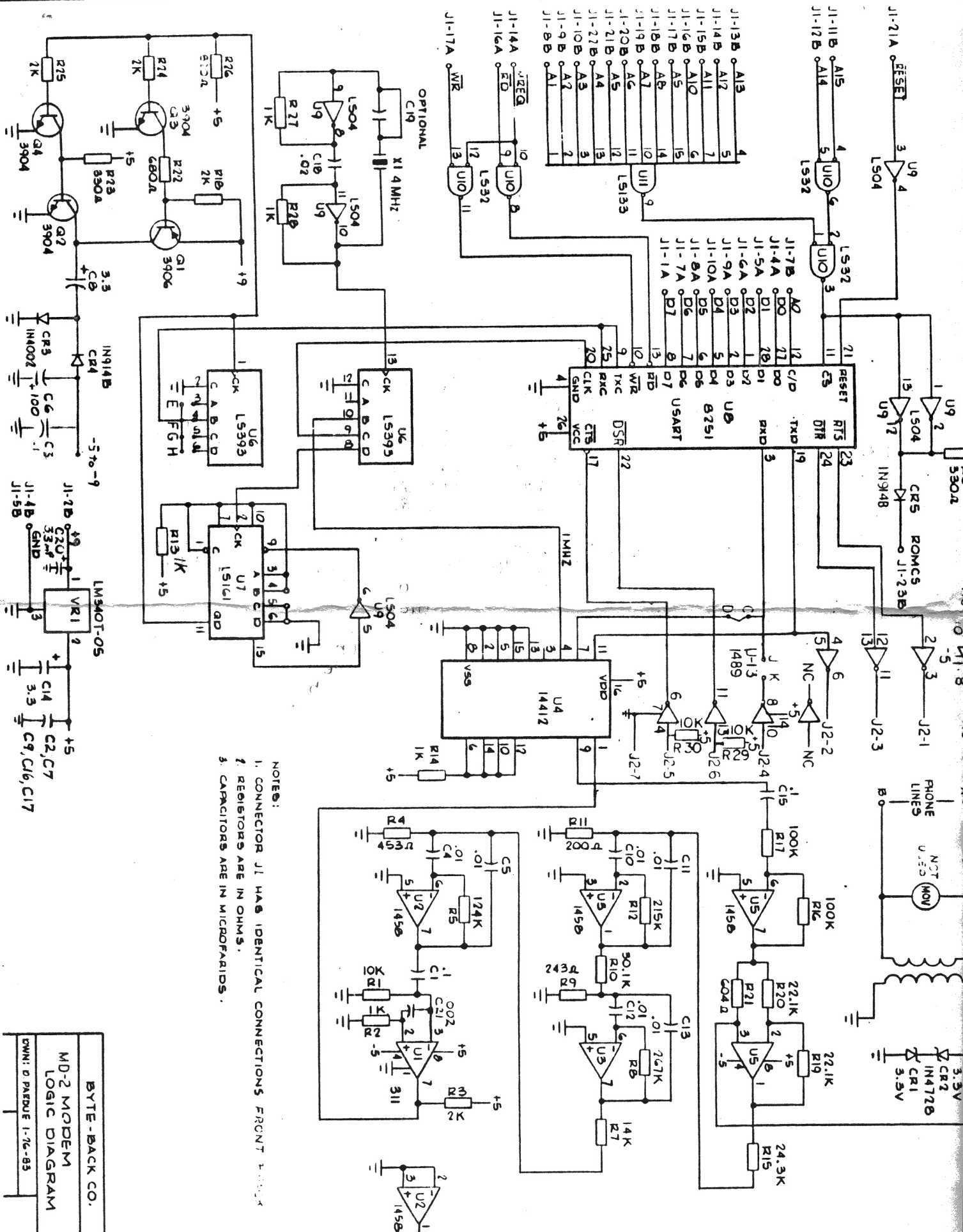
____ Do you own a microcomputer, terminal or communicating word processor?

If yes: (make/model)

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Bill of Materials

ITEM	QNTY	DESCRIPTION
1.	1	8251A IC-U8
2.	1	74LS393 IC-U6
3.	1	74LS161 IC-U7
4.	1	74LS04 IC-U9
5.	1	74LS32 IC-U10
6.	1	74LS133 IC-U11
7.	3	MC1458 IC-U2, U3, U5
8.	1	MC14412 VP IC-U4
9.	1	LM340T-5 IC-VR1
10.	1	LM311 IC-U1
11.	1	MC1488 IC-U12
12.	1	MC1489 IC-U13
13.	2	1N914B Diode CR4, CR5
14.	2	1N4728 Diode CR1, CR2
15.	1	1N4002 Diode CR3
16.	3	2N3904 Transistor Q2, Q3, Q4
17.	1	2N3906 Transistor Q1
18.	2	Resistor 330 $5\% \frac{1}{4}W$ R6, R23 (orange, orange, brown)
19.	1	Resistor 680 $5\% \frac{1}{4}W$ R22 (blue, gray, brown)
20.	5	Resistor 1k $5\% \frac{1}{4}W$ R14, R2, R13, R27, R28 (brown, black, red)
21.	1	Resistor 820 $5\% \frac{1}{4}W$ R26 (gray, red, brown)
22.	4	Resistor 2k $5\% \frac{1}{4}W$ R3, R18, R24, R25 (red, black, red)
23.	3	Resistor 10k $5\% \frac{1}{4}W$ R1, R29, R30 (brown, black, red)
24.	2	Resistor 100k $5\% \frac{1}{4}W$ R16, R17 (brown, black, yellow)
25.	1	Resistor 243 $1\% \frac{1}{4}W$ R9 (red, yellow, orange, black)
26.	1	Resistor 453 $1\% \frac{1}{4}W$ R4 (yellow, green, orange, black)
27.	1	Resistor 604 $1\% \frac{1}{4}W$ R21 (blue, black, yellow, black)
28.	1	Resistor 14k $1\% \frac{1}{4}W$ R7 (brown, yellow, black, red)
29.	2	Resistor 22.1k $1\% \frac{1}{4}W$ R19, R20 (red, red, brown, red)
30.	1	Resistor 24.3k $1\% \frac{1}{4}W$ R15 (red, yellow, orange, red)
31.	1	Resistor 30.1k $1\% \frac{1}{4}W$ R10 (orange, black, brown, red)
32.	1	Resistor 124k $1\% \frac{1}{4}W$ R5 (brown, red, yellow, orange)
33.	1	Resistor 215k $1\% \frac{1}{4}W$ R12 (red, brown, green, orange)
34.	1	Resistor 267k $1\% \frac{1}{4}W$ R8 (red, blue violet, orange)
35.	1	Resistor 200 $1\% \frac{1}{4}W$ R11 (red, black, black, black)
36.	6	Capacitor .01 mf 2% C4, C5, C10-C13 (labeled 5% or 10% but selected to 2%)
37.	8	Capacitor .1mf C1, C2, C3, C7, C9, C15, C16, C17 (blue, labeled 104)
38.	1	Capacitor .022 mf C18 (ceramic labeled 223z)
39.	3	Capacitor 3.3 mf C8, C14, C20 (Tantalum +3.3)
40.	1	Capacitor 100 mf C6 (electrolytic)
41.	1	Capacitor .002 mf C21 (ceramic labeled .002)
42.	1	Printed Circuit Board
43.	1	Finger Board
44.	1	6549 or T5114 Transformer
45.	1	Label
46.	1	Rocker switch
47.	1	Phone cord
48.	1	Deambee Socket (14 pin)
49.	1	4 Piece Case
50.	4	1x4-40 Screws (black)
51.	1	Crystal, 4 MHz
52.	1	Female Connector and Key
53.	1	Aluminum Heat Sink
54.	1	2-inch Jumper Wire



NOTE:
 1. CONNECTOR J1 HAS IDENTICAL CONNECTIONS FRONT AND BACK.
 2. RESISTORS ARE IN OHMS.
 3. CAPACITORS ARE IN MICROFARADS.

